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Dammertz

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(54) **RIP FENCE FOR A TABLE SAW HAVING INDEPENDENT ALIGNMENT AND LOCKING**

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(51) **Int. Cl.**
B27B 27/10 (2006.01)
B27B 27/02 (2006.01)

(52) **U.S. Cl.**
CPC ***B27B 27/10*** (2013.01); ***B27B 27/02*** (2013.01); *Y10T 83/73* (2015.04)

(58) **Field of Classification Search**
CPC B23Q 3/005; Y10T 83/727; Y10T 83/773; B27B 27/02; B27B 27/10
USPC 83/440, 446, 477.2
See application file for complete search history.

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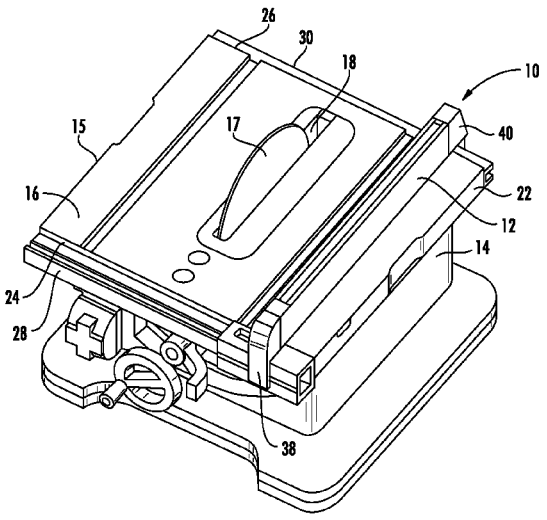
(57) **ABSTRACT**

A rip fence for a table saw includes a frame having a front portion and a rear portion. A front clamping lever is pivotably supported in the front portion of the frame for movement between a clamped and an unclamped position. A handle is pivotably supported in the front portion of the frame for movement between a locked and an unlocked position. The handle includes a lever portion that engages the front clamping lever and moves the front clamping lever from the unclamped to the clamped position when the handle is moved from the unlocked position toward the locked position. A rear clamping lever is attached to the rear portion of the frame and movable between a clamped and unclamped position. When the front clamping lever is moved to clamped position by the lever portion of the handle, continued movement of the handle to locked position results in the handle pulling the rear clamping lever from the unclamped to the clamped position.

11 Claims, 9 Drawing Sheets



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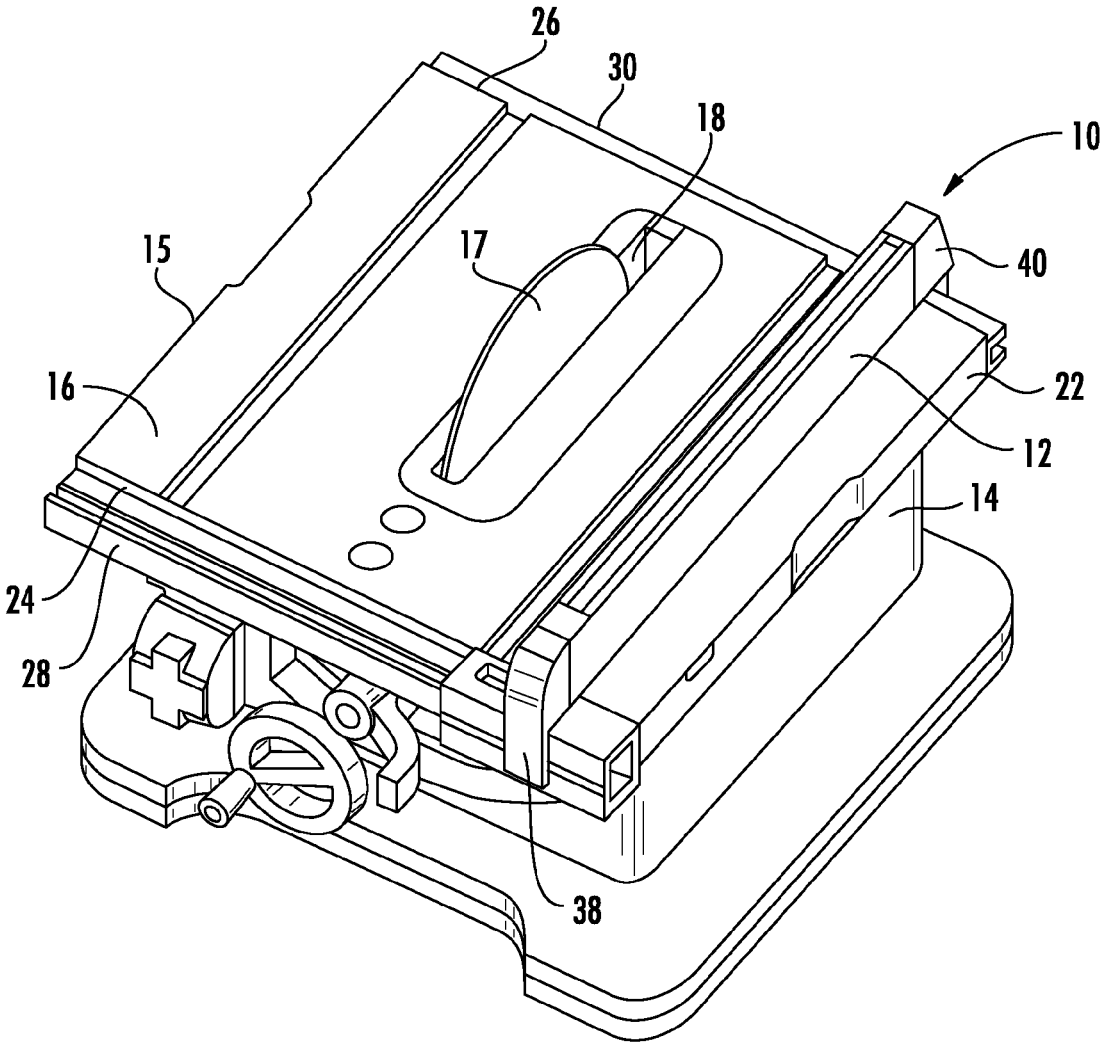

FIG. 1

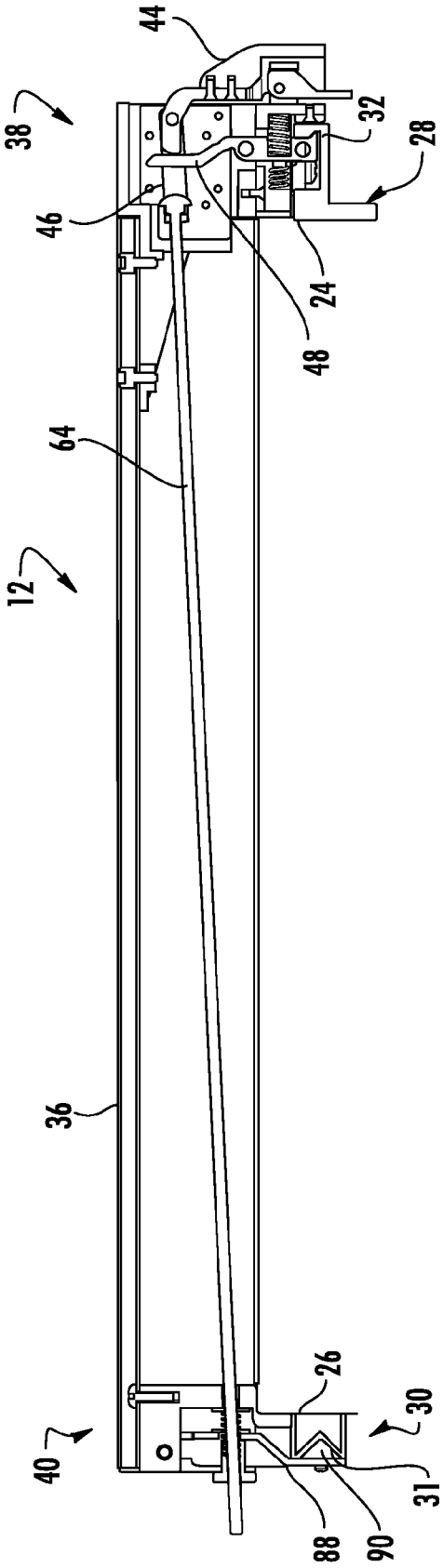

FIG. 2

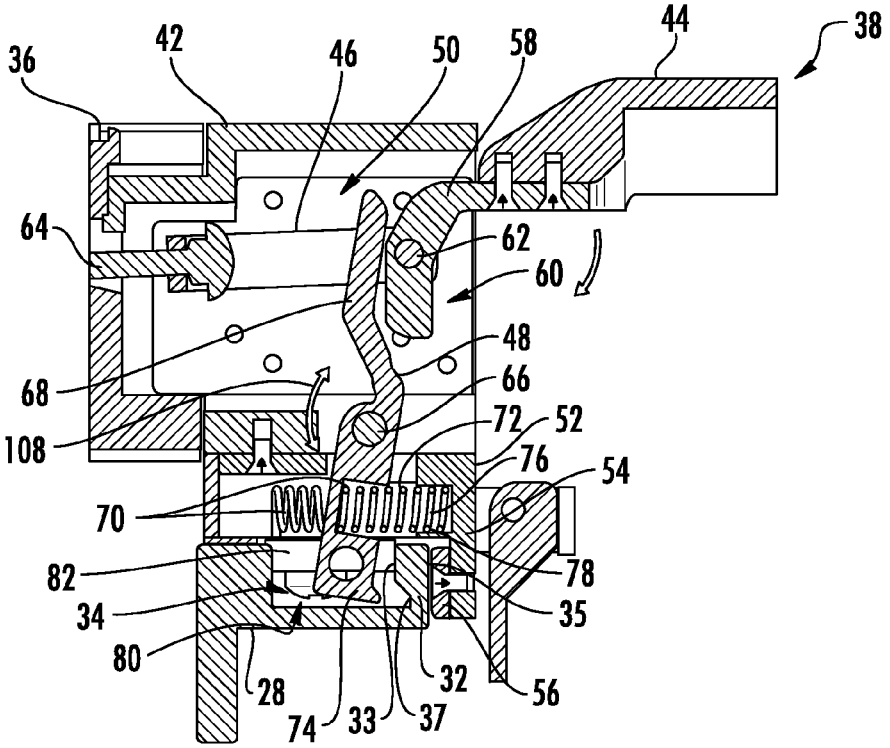
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FIG. 3

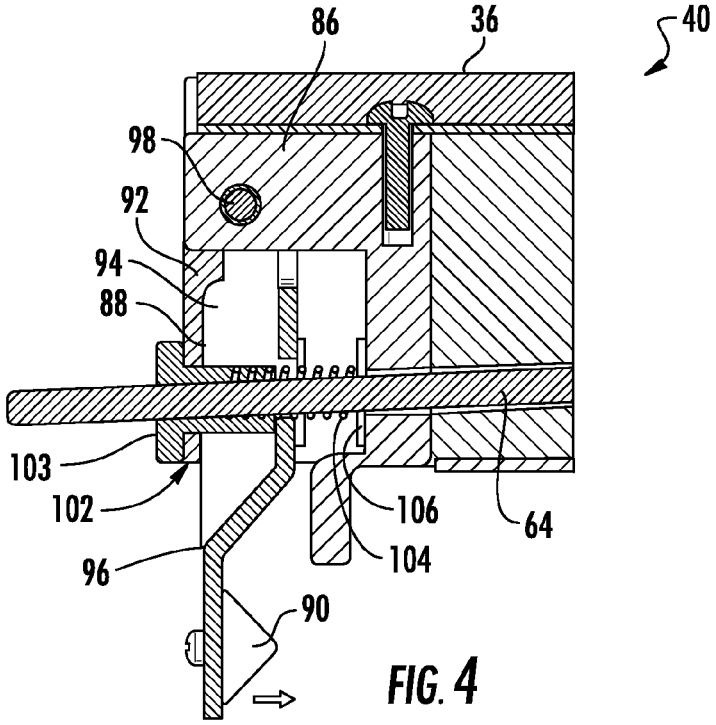
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FIG. 4

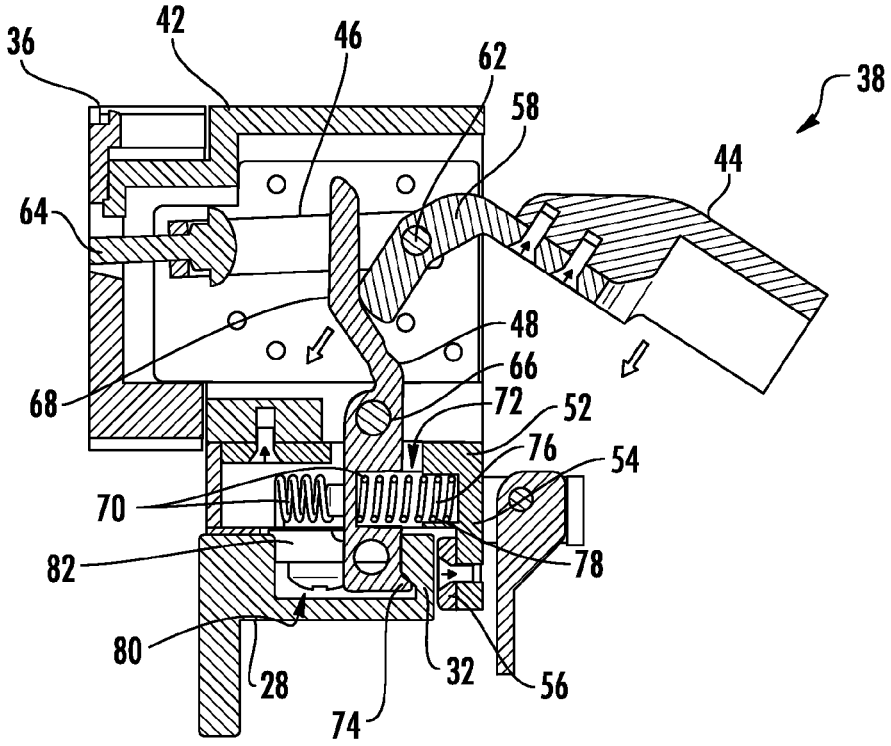
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FIG. 5

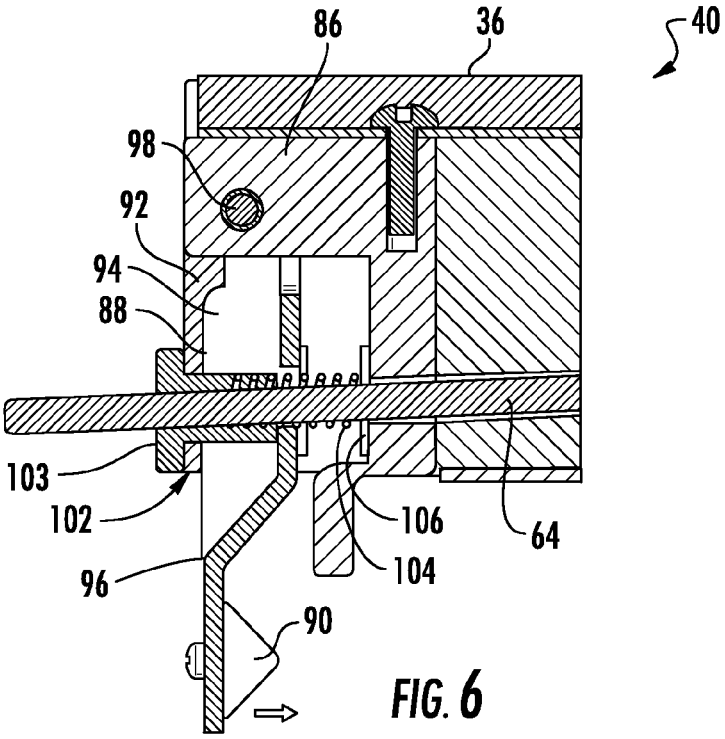
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FIG. 6

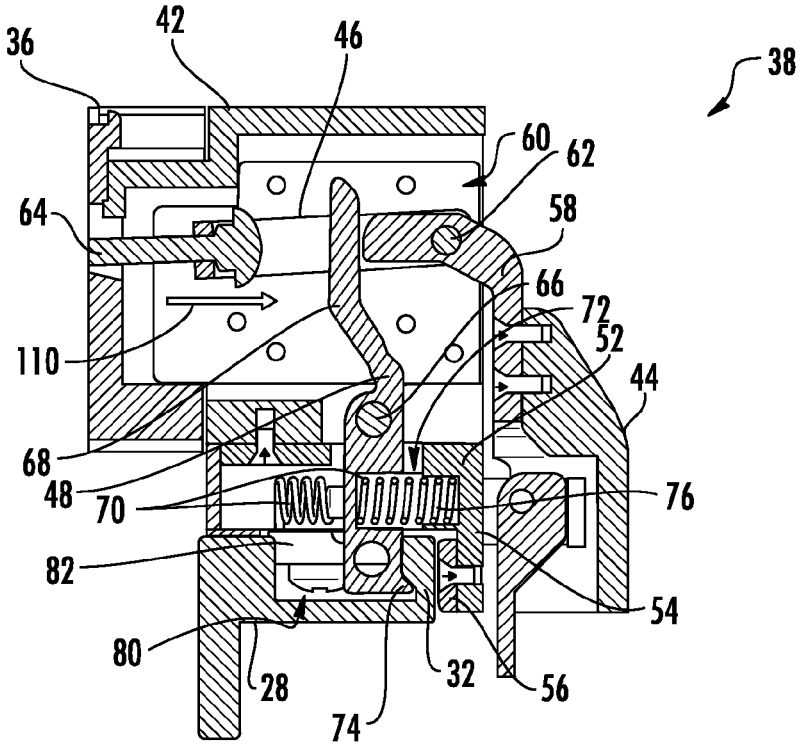
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FIG. 7

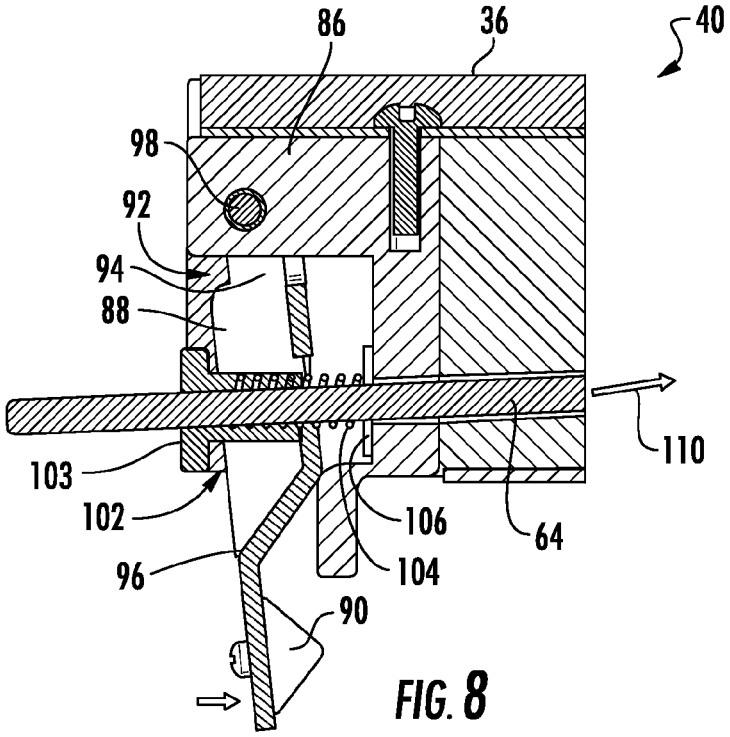
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FIG. 8

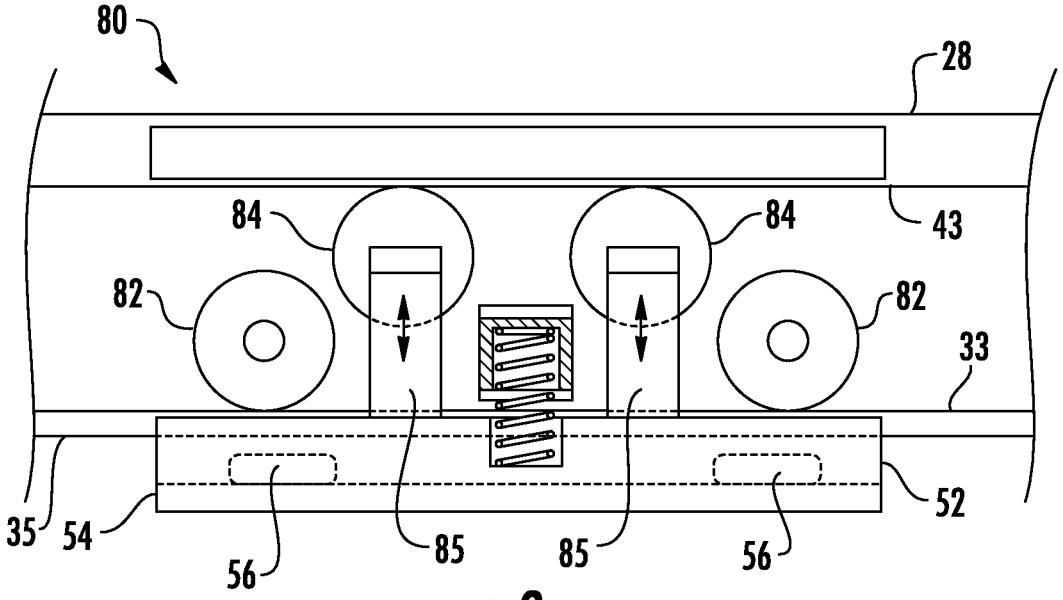
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FIG. 9

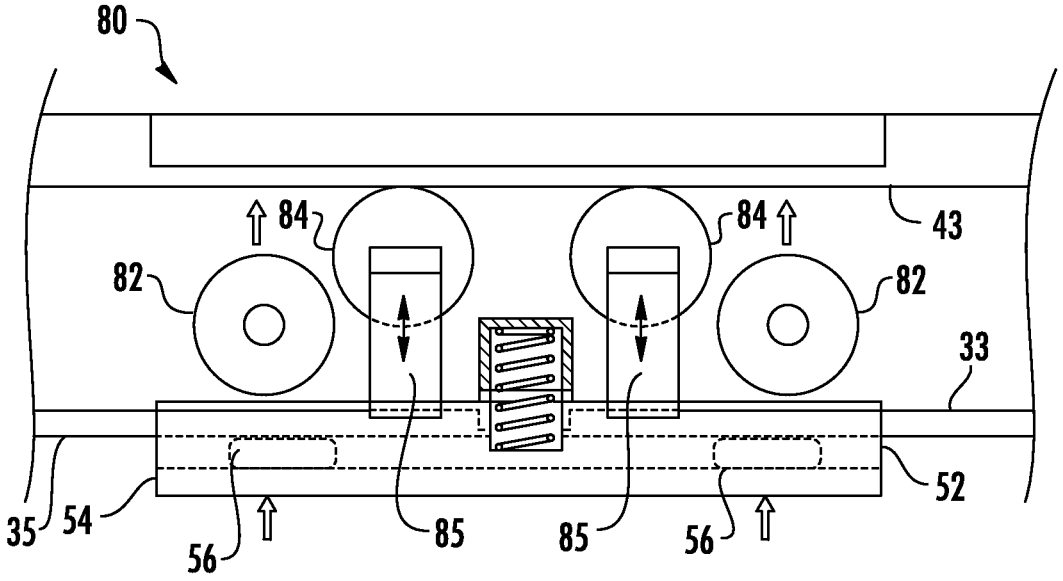
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FIG. 10

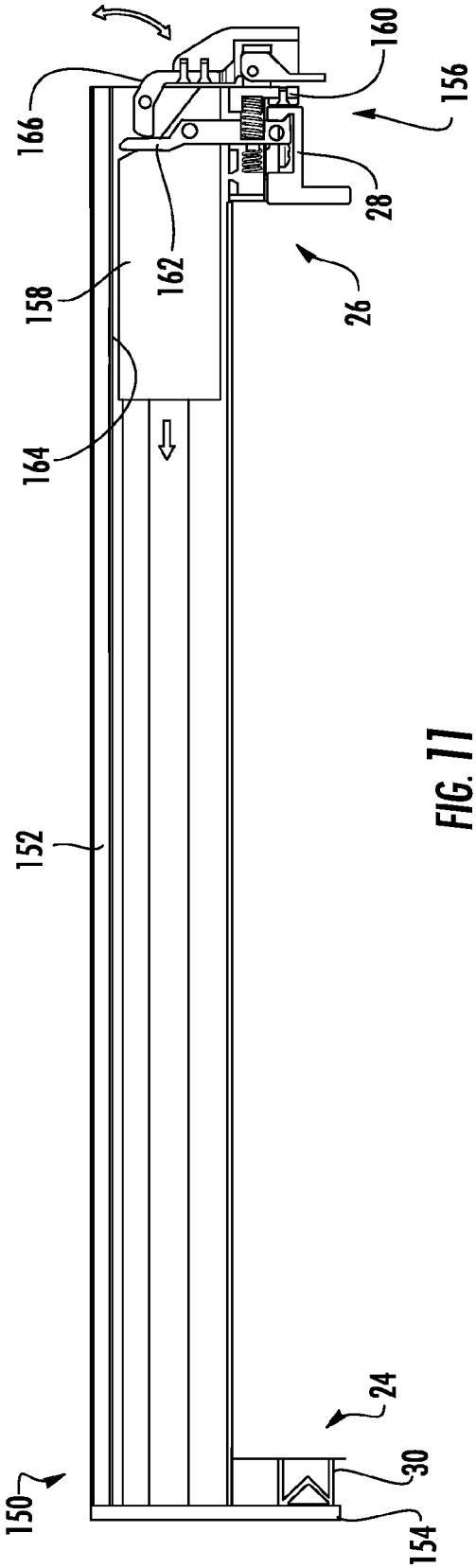

FIG. 11

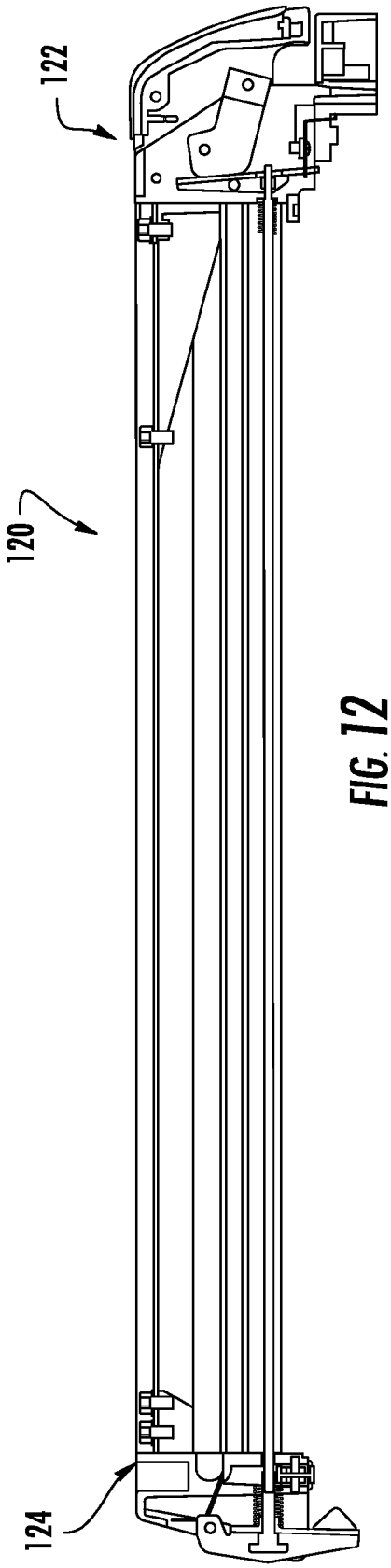

FIG. 12
(PRIOR ART)

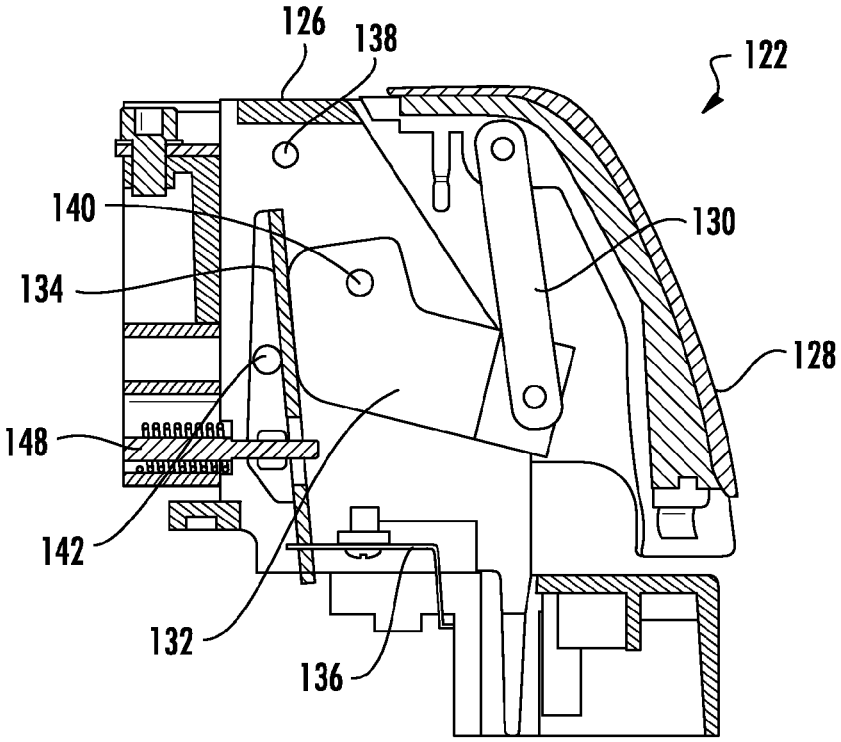

FIG. 13
(PRIOR ART)

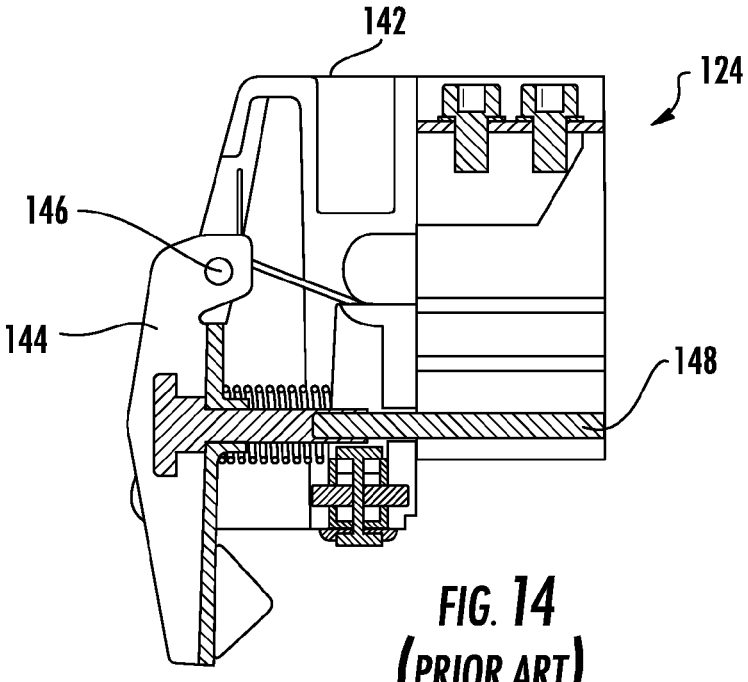

FIG. 14
(PRIOR ART)

RIP FENCE FOR A TABLE SAW HAVING INDEPENDENT ALIGNMENT AND LOCKING

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Provisional Application Ser. No. 61/747,395 entitled "RIP FENCE FOR A TABLE SAW HAVING INDEPENDENT ALIGNMENT AND LOCKING" by Ralph Dammertz filed Dec. 31, 2012, and to U.S. Provisional Application Ser. No. 61/781,341 entitled "RIP FENCE FOR A TABLE SAW HAVING INDEPENDENT ALIGNMENT AND LOCKING" by Ralph Dammertz filed Mar. 14, 2013, the disclosures of which are each incorporated herein by reference in their entirety.

TECHNICAL FIELD

This disclosure relates generally to table saws, and particularly to rip fences for use with table saws.

BACKGROUND

Table saws of various designs include a frame and an upper surface having an opening through which a blade extends. The upper surface supports a material, such as wood, as it is pushed towards the blade for cutting. Table saws have traditionally been stand-alone pieces of equipment that are used in workshops. Because most stand-alone table saws are used in large open spaces, the dimensions of the table saw can be large enough to support materials of various sizes for cutting. Tables that are used in workshops are not readily moved from one location to another. At construction sites, it is useful to have a table saw that can be easily moved from one location to another or between different construction sites. Accordingly, smaller and portable table saws have been designed. These table saws use lighter materials and have reduced the dimensions of the frame and the upper surface to reduce the size and weight of the table saw thereby creating the desired portable table saw. The portable table saws also use a separable folding stand to hold the table saw at the correct height for operation.

An integral part of most table saws is a movable rip fence. The rip fence is positioned perpendicular to the upper cutting surface and is aligned generally parallel to the position of the blade. Most rip fences are designed to span between the front edge and the rear edge of the upper cutting surface. Moreover, the rip fence can be positioned in any position along the upper surface and is secured in such a position by a locking mechanism. The rip fence is usually secured in a position a given distance away from the blade and can be put on either side of the blade. When the rip fence is secured in a position, the wood can be pushed against the side of the rip fence to slide on the upper surface to be cut by the blade. Thus, accurate and straight cuts can be made.

Rip fences of various different designs are readily known in the prior art. In addition, different methods of securing the rip fence at a given location on the upper surface, including the use of a locking mechanism, are known. One of the primary objectives for the rip fence is for it to be generally parallel to the blade so that the most accurate cuts can be made. It is known that an effective way to make the rip fence parallel with the blade is to force it to be perpendicular to the front and rear edge surfaces of the table saw. Thus, many rip fences use a front locking mechanism and a rear locking mechanism. The front locking mechanism presses against the front edge surface and the rear locking mechanism presses against the rear edge surface. In this way, the locking mechanism aligns the rip fence perpendicular to the edge surfaces and parallel to the blade.

It is also helpful to properly align the rip fence if the front and rear locking mechanism move simultaneously. To achieve this, rip fences typically include a handle which is connected to the front locking mechanism and a rod that connects between the handle and the rear locking mechanism. When the handle is in a first and released position, the front locking mechanism is positioned in a released position relative the front edge surface and the rod reduces pressure and allows the rear locking position to move into a released position relative the rear edge surface. When the handle is in a second and locked position, the front locking mechanism is positioned in a locked position along the front edge surface and the rod pushes the rear locking mechanism into the locked position. As the handle moves from the released to the locked position, the front and rear locking mechanism engage with the front and rear edges at the same time.

Different types of front and rear locking mechanisms are known. Some front locking mechanisms include a cam that is connected to a handle such that when the handle is put into the locked position, the cam is pushed against a surface on the front edge of the table saw to secure the rip fence in position. FIGS. **12-14** depict one type of previously known rip fence in a locked position. The rip fence **120** of FIGS. **12-14** includes a front locking mechanism **122** and a rear locking mechanism **124**. The front locking mechanism **122** includes a frame **126**, a handle **128**, a linkage **130**, a cam **132**, a lever **134**, and a spring plate **136**. The handle **128** is pivotally connected to the frame **126** at a pivot point **138**, the cam **132** is pivotally connected to the frame **126** at pivot point **140**, and the lever **134** is pivotally connected to the frame **126** at point **142**. The linkage **130** is attached at one end to the handle **128** and at the other end to the cam **132**. The rear locking mechanism **124** includes a frame **142** and a clamping lever **144**. The rear clamping lever **144** is pivotally connected to the frame **142** at a pivot point **146**. The front and rear locking mechanisms **122**, **124** are coupled together by a clamping rod **148** that extends between and connects the lever **134** of the front locking mechanism **122** to the lever **144** of the rear locking mechanism **124**.

When the handle **128** is pivoted upwardly from the locked position about pivot point **138**, the linkage **130** pulls cam **132** causing the cam **132** to pivot about pivot point **140**. The cam **130** is positioned to actuate the lever **134** causing the lever to pivot about pivot point **142**. The lever **134** does two things. First, it pushes the spring plate **136** against the front rail (not shown) of the table saw creating a spring force which causes the guide block to be pulled against the rail thus aligning the frame (and the overall fence) with the rail (and the blade). Second, it pulls the clamping rod **148**. The clamping rod **148** in turn pivots the rear clamping lever **144** about the pivot point **146** into engagement with the rear guide rail of the table saw.

While effective, there is no separation between the alignment force generated by the spring plate **136** and the locking force generated by the rear clamping lever **144** when locking the fence onto the rails. The spring plate **136** and the rear clamping lever **144** are both controlled by the cam **132** and lever **134** action. Therefore, the system must be balanced between alignment force in the spring and clamping force in the rear clamping lever. An increase in clamping force may result in a decrease in alignment force as the rear of the fence may clamp before the spring creates enough force to move/align the rip fence. Conversely, increasing the alignment force may result in the spring touching the front rail when the

system is unlocked which can result in damage to the rail as well as unpleasant noises and/or vibrations when the position of the fence is adjusted.

DRAWINGS

FIG. **1** depicts a table saw including a rip fence in accordance with the present disclosure.

FIG. **2** depicts a side cross-sectional view of rip fence of FIG. **1**.

FIG. **3** depicts a side cross-sectional view of the front locking mechanism of the rip fence of FIG. **2** in an unlocked position.

FIG. **4** depicts a side cross-sectional view of the rear locking mechanism of the rip fence of FIG. **2** in an unlocked position.

FIG. **5** depicts a side cross-sectional view of the front locking mechanism of the rip fence of FIG. **2** in an intermediate position.

FIG. **6** depicts a side cross-sectional view of the rear locking mechanism of the rip fence of FIG. **2** in an intermediate position.

FIG. **7** depicts a side cross-sectional view of the front locking mechanism of the rip fence of FIG. **2** in a locked position.

FIG. **8** depicts a side cross-sectional view of the rear locking mechanism of the rip fence of FIG. **2** in a locked position.

FIG. **9** depicts the bearing and alignment assembly of the rip fence of FIG. **2** when the locking mechanisms are in the unlocked positions of FIGS. **3** and **4**.

FIG. **10** depicts the bearing and alignment assembly of the rip fence of FIG. **2** when the locking mechanisms are in the locked positions of FIGS. **7** and **8**.

FIG. **11** depicts another embodiment of a rip fence for use with the table saw of FIG. **1**.

FIG. **12** depicts a side cross-sectional view of a rip fence according to the prior art.

FIG. **13** depicts a side cross-sectional view of the front locking mechanism of the prior art rip fence of FIG. **12**.

FIG. **14** depicts a side cross-sectional view of the rear locking mechanism of the prior art rip fence of FIG. **12**.

DESCRIPTION

For the purposes of promoting an understanding of the principles of the disclosure, reference will now be made to the embodiments illustrated in the drawings and described in the following written specification. It is understood that no limitation to the scope of the disclosure is thereby intended. It is further understood that the present disclosure includes any alterations and modifications to the illustrated embodiments and includes further applications of the principles of the disclosure as would normally occur to one of ordinary skill in the art to which this disclosure pertains.

In accordance with one embodiment of the present disclosure, a rip fence for a table saw includes a frame having a front portion and a rear portion. A front clamping lever is pivotably supported in the front portion of the frame for movement between a clamped and an unclamped position. A handle is pivotably supported in the front portion of the frame for movement between a locked and an unlocked position. The handle includes a lever portion that engages the front clamping lever and moves the front clamping lever from the unclamped to the clamped position when the handle is moved from the unlocked position toward the locked position. A rear clamping lever is attached to the rear portion of the frame and movable between a clamped and unclamped position. When the front clamping lever is moved to clamped position by the lever portion of the handle, continued movement of the handle to locked position results in the handle pulling the rear clamping lever from the unclamped to the clamped position.

In accordance with another embodiment, a table saw includes a table having an upper surface and defining a blade opening. A cutting assembly is supported below the table and includes a saw blade that extends upwardly through the blade opening. A front guide rail is attached to a front edge portion of the table, and a rear guide rail is attached to a rear edge portion of the table. A rip fence is slidably supported by the front guide rail and the rear guide rail. The rip fence includes a frame having a front portion and a rear portion. A front clamping lever is pivotably supported in the front portion of the frame for movement between a clamped and an unclamped position. A handle is pivotably supported in the front portion of the frame for movement between a locked and an unlocked position. The handle includes a lever portion that engages the front clamping lever and moves the front clamping lever from the unclamped to the clamped position when the handle is moved from the unlocked position toward the locked position. A rear clamping lever is attached to the rear portion of the frame and movable between a clamped and unclamped position. The front clamping lever is configured to be moved into and out of engagement with the front guide of the table saw when moved between the clamped and the unclamped positions. The rear clamping lever is configured to be moved into and out of engagement with the rear guide of the table saw when moved between the clamped and unclamped positions. When the front clamping lever is moved to clamped position by the lever portion of the handle, continued movement of the handle to locked position results in the handle pulling the rear clamping lever toward the front portion of the frame and into the clamped position.

FIG. **1** illustrates a table saw **10** having a rip fence **12** in accordance with the principles of the present invention. The table saw **10** can be of any known type such as a stand-alone table saw or a portable table saw. The table saw **10** includes a frame **14** and a main table **15**. The frame defines an enclosure space (not visible) where the components of the cutting assembly, such as a motor (not shown), drive system (not shown), bevel and blade height adjustment system (not shown), and circular saw blade **17**, are mounted. The main table **15** is supported on the frame **14** above the cutting assembly and includes a generally planar upper surface **16** that serves as a workpiece support surface. The circular saw blade **17** extends upwardly through a blade opening **18** defined in the main table **15**.

In one embodiment, as seen in FIG. **1**, the table saw includes an extension table **22** that is movable between a position adjacent the upper cutting surface and an extended position separated from the main table **15**. The main table and extension table each include a front edge portion **24** and a rear edge portion **26**. A front rail **28** is secured to the front edge portion **24**, and a rear rail **30** is secured to the rear edge portion **26**. The rails **28**, **30** are configured to interact with the locking mechanisms **38**, **40** of the rip fence **12**.

Referring to FIGS. **2-10**, the front rail **28** includes an upwardly extending guide flange **32** that extends longitudinally along the outer portion of the front rail **28**. The guide flange **32** includes a first inner surface **33** that faces toward the table saw **10** and a second inner facing surface **43** that faces away from the table saw **10**. The first inner surface **33** and second inner surface **43** define an upward facing slot **34** therebetween (See, e.g., FIG. **3**). The inner surface **33** includes a recessed portion that forms a groove **37** located near the bottom surface of the slot **33**. The guide flange **32**

also includes an outer surface **35** that faces away from the table saw **10**. The guide flange **32** and the slot **34** are configured to interact with the front locking mechanism **38** of the rip fence **12**. The rear rail **30** extends longitudinally along the rear edge portion **26** of the main table **15** and extension table **22** and includes features, such as a slot or groove **31** (See, e.g., FIG. **2**), for interacting the rear locking mechanism **40** of the rip fence **12**.

Referring to FIGS. **2-10**, the rip fence **12** includes a main casing **36**, a front locking mechanism **38**, a rear locking mechanism **40**, a handle **44**, a linkage **46**, **64**, and a bearing and alignment assembly **80**. The main casing **36** has a generally rectangular form and is configured to extend longitudinally between the front edge portion **24** and rear edge portion **26** of the main table **15**. The front locking mechanism includes a front clamping lever **48** that is movable into and out of engagement with the front guide rail **28**, i.e., between a clamped and unclamped position, about a pivot point **66**. The rear locking mechanism **40** is attached to the rear end of the main casing **36** and includes a rear clamping lever **88** that is movable into and out of engagement with the rear rail **30**, i.e., between a clamped and unclamped position, about a pivot point **98**. Alternatively, the front and rear clamping levers **48**, **88** may be configured for sliding movement into and out of engagement with the front and rear guide rails.

The handle **44** is pivotably attached to the front end portion of the casing **36** for pivotable movement about a third pivot point **62** between a locked and an unlocked position. The handle includes a lever portion **58** that engages the front clamping lever and moves the front clamping lever from the unclamped position to the clamped position when the handle is moved from the unlocked position toward the locked position. A linkage couples the handle **44** and the rear clamping lever **88** so that, when the handle is moved to the locked position, the rear clamping lever **88** is also moved from the unclamped to the clamped position. In the embodiment of FIGS. **2-10**, the linkage comprises a rod **64** and bracket **46**. In the embodiment of FIG. **11**, the linkage comprises the casing of the fence itself.

In the clamped position, the front and rear locking mechanisms **38**, **40** are configured to secure the rip fence to the rails **28**, **30**. In the unclamped position, the rip fence is allowed to slide along the rails **28**, **30** by the bearing and alignment assembly **80** to allow the rip fence **12** to be positioned a desired distance from the blade **17**. The front and rear locking mechanisms **38**, **40** are not used to align the rip fence. As explained below, the bearing and alignment assembly **80** is configured to generate an alignment force that maintains the rip fence at a desired orientation with respect to the table saw, e.g., parallel to the blade, while the rip fence is being moved. The front and rear locking mechanisms **38**, **40** are configured to engage the front and rear rails **28**, **30** to secure the rip fence in position on the table saw without altering the alignment generated by the bearing and alignment assembly **80**.

Referring to FIGS. **2**, **3**, **5**, and **7**, the front locking mechanism **38**, the handle **44**, and the bearing and alignment assembly **80** are supported by a front frame **42**. The front frame **42** is attached to the front end of the main casing **36** and defines an interior space **50** for receiving the components of the front locking mechanism **38**. The front frame **42** is supported on an L-shaped member **52**. The L-shaped member **52** includes a clamping portion **54** that extends downwardly from the frame **42** adjacent to the outer surface **35** of the guide flange **32**. The clamping portion **54** includes a clamping pad **56**, e.g., rubber or plastic, that is pressed against the outer surface **35** of the guide flange **32** during clamping.

The handle **44** is configured to pivot with respect to the front frame **42** between an upward position (FIG. **3**), or unlocked position, and a lower position (FIG. **7**), or locked position. The handle **44** includes a lever portion **58** that extends through a front opening **60** of the front frame **42** into the interior space **50** where it is pivotally attached to the linkage. In the embodiment of FIGS. **2-10**, the linkage comprises a clamping bracket **46** and a clamping rod **64** that are used to operably connect the front and rear locking mechanisms **38**, **40**. The handle is pivotably attached to the clamping bracket **46** at the pivot point **62**. The clamping rod **64** is coupled at one end to the clamping bracket **46** and coupled at the other end to the rear clamping lever **88** in the rear locking mechanism **40** (See, e.g., FIG. **2**). The clamping bracket **46** and clamping rod **64** are configured to translate axially within the casing to allow the pivot point **62** to move with respect to the pivot points **62**, **98** of the front and rear clamping levers **48**, **88**.

The clamping bracket **46** and clamping rod **64** are supported for movement between a rearward position (FIG. **3**) and forward position (FIG. **7**). In the rearward position, the rear clamping lever **88** is in a released position, and in the forward position, the rear clamping lever **88** is in a clamped position. The clamping rod **64** can have any suitable configuration and can extend, as a single rod, down the center or along an inner sidewall of the casing. In one embodiment, a pair of clamping rods (not shown) may be used that extend along each inner sidewall of the casing with the clamping bracket configured as a yoke in order to move them both simultaneously.

The front clamping lever **48** is pivotally attached to the front frame **42** at a pivot point **66** located in a middle portion of the front clamping lever **48**. The front clamping lever **48** includes an upper portion **68** and a lower portion **70**. The upper portion **68** extends generally upwardly from the pivot point **66** to a position where it can be engaged by the lever portion **58** of the handle **44**. The lower portion **70** extends generally downwardly from the pivot point **66** through a passage **72** that extends through the bottom of the front frame **42** and through the L-shaped member **52** and is received in the slot **34** of the front guide rail **28**.

The front clamping lever **48** is configured to pivot with respect to the front frame **42** between a clamped position (FIG. **7**) and a released position (FIG. **3**). In the clamped position, the lower portion **70** of the front clamping lever **48** is positioned in engagement with the inner surface **33** of the guide flange **32**. In the released position, the lower portion **70** of the front clamping lever **48** is spaced apart from the inner surface **33** of the flange **32**. The lower portion **70** of the front clamping lever **48** may include a projection **74** that is sized and positioned to be received in the groove **37** (See, e.g., FIG. **3**) defined in the inner surface **33** of the guide flange **32** when the front clamping lever **48** is in the locked position.

The lever portion **58** of the handle **44** has a cam-shaped portion that is configured to interact with the upper portion **68** of the front clamping lever **48**. As can be seen in FIG. **3**, when the handle **44** is in the upward, unlocked position, the lever portion **58** of the handle **44** is configured to allow the upper portion **68** of the front clamping lever **48** to move to the released position. The lower portion **70** of the front clamping lever **48** is biased away from the inner surface **33** of the guide flange **32** by a biasing member **76**, such as a coil spring. The coil spring **76** is positioned between the clamping portion **54** of the L-shaped member **52** and the lower portion **70** of the front clamping member **48** so that the coil spring **76** is compressed when the lower portion moves toward the guide flange **32**. When the handle **44** is in the upward position, the

spring **76** is allowed to decompress and return the front clamping lever **48** to the released position. As depicted, the coil spring **76** is received in a recess **78** defined in the lower portion **70** of the clamping lever **48**. In alternative embodiments, any suitable type of biasing member or biasing configuration may be used. Referring to FIGS. **2**, **4**, **6**, and **8**, the rear locking mechanism **40** includes a rear frame **86**, a rear clamping lever **88**, and a friction block **90**. The rear frame **86** is attached to the rear end portion of the casing **36** and defines an interior space **92** for receiving and mounting the components of the rear locking mechanism **40**. The rear clamping lever **88** includes an upper portion **94** and a lower portion **96**. The upper portion **94** of the rear clamping lever **88** is pivotally attached to the rear frame **86** at pivot point **98** and extends downwardly through an opening **102** in the bottom of the rear frame **86** to a position adjacent to the rear guide rail **30** (FIG. **2**).

The clamping rod **64** extends into the interior space **92** of the rear frame **86** where it is attached to an intermediate portion of the rear clamping lever **88**. The rear clamping lever **88** is configured to be pivoted about the pivot point **98** by the clamping rod **64** between a clamped position (FIG. **8**) and a released position (FIG. **4**). In the released position, the lower portion **96** of the rear clamping lever **88** is spaced apart from the rear rail **30**. In the clamped position, the lower portion **96** is pivoted into engagement with the rear rail **30**. The friction block **90** is attached to the lower portion **96** of the rear clamping lever **88** in order to engage the rear rail **30** when the rear clamping lever **88** is in the clamped position. As depicted in FIG. **2**, the friction block **90** may be received in the groove **31** defined in the rear rail **30**.

A biasing member **104**, such as a coil spring, is positioned to bias the rear clamping lever **88** toward the released position. The biasing member **104** is located between the rear clamping lever **88** and an inner wall **106** of the rear frame **86** so as to be compressed when the lower portion **96** of the rear clamping lever **88** is pivoted toward the rear rail **30**. The biasing member **104** also serves to bias the clamping bracket **46** toward the rearward position (FIG. **3**). In alternative embodiments, the rear clamping lever **88** and clamping bracket **46** may be biased toward the released and rearward positions, respectively, in any suitable manner.

The bearing and alignment assembly **80** is attached to the L-shaped member **52**. When the front and rear locking mechanisms **38**, **40** are in unlocked positions as depicted in FIGS. **3** and **4**, respectively, the bearing and alignment assembly **80** is configured to allow the rip fence **12** to slide along the guide rails while simultaneously maintaining the rip fence in alignment with the saw blade. As depicted in FIGS. **9** and **10**, the bearing and alignment assembly **80** includes a pair of fixed or stationary roller bearings **82** and a pair of spring-loaded roller bearings **84**. The stationary roller bearings **82** are mounted in a fixed position to the L-shaped member **52** for engaging the first inner surface **33** of the guide rail **28**. The spring-loaded bearings **84** are mounted to the L-shaped member **52** by spring-loading mechanisms **85** which load the bearings **84** against the second inner surface **43** at all times.

When the locking mechanisms **38**, **40** are in unlocked positions (FIGS. **3** and **4**), the spring-loading mechanisms **85** are configured to load the bearings **84** against the second inner surface **43** of the slot **34** with sufficient force to push the L-shaped member **52** away from the main table **15**. This results in the stationary bearings **82** being moved into engagement with the first inner surface **33** of the slot **34** to serve as alignment bearings as depicted in FIG. **9**. When the stationary bearings **82** are positioned in engagement with the first inner surface **33** and the spring-loaded bearings **84** are loaded against the second inner surface **43** as depicted in FIG. **9**, the force generated by the spring-loading mechanisms **85** serves as an alignment force for maintaining the rip fence **12** at a fixed orientation with respect to the main table **15** and the blade **17**. This orientation is maintained while the roller bearings **82**, **84** are slid along the inner surfaces **33**, **43** of the slot **34** when adjusting the position of the rip fence **12**.

The force generated by the spring-loading mechanisms **85** must be overcome to bring the clamping pads **56** on the clamping portion **54** of the L-shaped member **52** into pressing engagement with the outer surface **35** of the front guide rail **28** as depicted in FIG. **10**. The configuration of the front and rear locking mechanisms **38**, **40** enables the force of the spring-loading mechanisms **85** to be overcome so that the fence **12** can be locked in position without altering the alignment of the rip fence. This is achieved by a design that allows both front and rear clamping levers **48**, **88** to engage with the respective rails **28**, **30** and apply force against them while the roller bearings **82**, **84** are still loaded against the inner surfaces **33**, **43** of the front guide rail **28**.

After the front and rear clamping levers **48**, **88** have engaged the front and rear guide rails **28**, **30** and applied a clamping force thereto, further clamping force overcomes the spring force of the spring-loading mechanisms **85** and causes the rip fence **12** to slide forward a small distance. This results in the stationary bearings **82** being moved away from the first inner surface **33** of the front guide rail and brings the clamping pads **56** into engagement with the outer surface **35** of the front guide rail **28** so that the rip fence **12** can be locked in position. Because front and rear contact in conjunction plus clamp force is required to disengage the stationary alignment bearings, the fence does not change alignment in the locking phase. Once the fence is fully locked, alignment is secured mainly by clamping force and the front pads **56** are pressed against the outside of the front rail, further supporting the alignment.

To bring the front and rear clamping levers **48**, **88** into engagement with the front and rear rails **28**, **30**, the handle **44** is pivoted downwardly from the upward position depicted in FIG. **3** to the intermediate position depicted in FIG. **5**. In the intermediate position, the cam-shaped lever portion **58** of the handle **44** engages the upper portion **68** of the front clamping lever **48** and causes the front clamping lever **48** to pivot about the pivot point **66** in direction indicated by arrow **108**. As a result, the lower portion **70** of the front clamping lever **48** is pivoted into engagement with the inner surface **33** of the guide flange **32**.

As the handle **44** pivots downwardly, the lever portion **58** of the handle is leveraged against the upper portion **68** of the front clamping lever **48**. As a result, force exerted against the upper portion **68** of the front clamping lever **48** by the lever portion **58** of the handle **44** is converted to a pulling force on the clamping bracket **46** in direction **110**. Thus, as the handle **44** is pivoted downwardly from the unlocked position (FIG. **3**) to the intermediate position (FIG. **5**), the lever portion **58** of the handle **44** pulls the clamping bracket **46** from the rearward position toward the forward position. The clamping bracket **46** in turn pulls the clamping rod **64** in direction toward the front of the table saw **10**. As the clamping rod is pulled in direction **110**, the rear clamping lever **88** of the rear locking mechanism is pivoted from the released position (FIG. **4**) to the intermediate position (FIG. **6**). When the front and rear clamping levers **48**, **88**, are in the intermediate position (FIGS. **5** and **6**, the stationary roller bearings **82** are still engaged with the first inner surface **33** of the front guide rail **28** and the clamping pads **56** are still spaced apart from the outer surface of the front guide rail **28** as depicted in FIG. **9**.

Continued movement of the handle **44** downwardly from the intermediate position (FIG. **5**) toward the locked position (FIG. **7**) with the lever portion **58** of the handle leveraged against the upper portion **68** of the front clamping lever **48** results in more pulling force being applied to the to the clamping bracket **46**, clamping rod **64**, and rear clamping lever **88**. With the front and rear clamping levers **48**, **88** clamped against the front and rear guide rails, the pulling force overcomes the spring force of the spring-loading mechanisms **85** and results in the rip fence **12** sliding in a direction from the front to the rear of the table until the clamping pads **56** are pressed against the outer surface **35** of the front guide rail **28** as depicted in FIG. **10**. This action is enabled in part by the geometries of the front and rear lever arms and the length of the clamping rod/bracket. In one embodiment, the front and rear levers are configured so that the front lever exerts a substantially larger force onto the rail surface **34** than the rear lever exerts onto the rear rail, e.g., 2-3 times as much. As a result, the whole fence assembly slides toward the rear of the table until the clamping pads **56** on the clamping portion **54** of the L-shaped member **52** are brought into contact with the outer surface **35** of the front rail.

Once the clamping pads **56** are moved into engagement with the outer surface **35** of the front guide rail **28**, further movement of the handle to the fully closed position (FIG. **7**) requires compliance which is built into the system by the geometries and movement paths of the components and linkages in the system. This compliance is used to generate the final clamping force applied by the clamping portion **54**/clamping pads **56** and the rear clamping lever **88** against the outer surface **35** of the front rail **28** and the rear rail **30**, respectively. In one embodiment, the amount of clamping force generated by the assembly can be adjusted by lengthening or shortening the clamping rod **64**. As one example of how this can be accomplished, the clamping rod **64** may be provided with a threaded end portion that is received in a complementarily threaded fastener structure **103** incorporated into the rear locking mechanism **40** as depicted in FIGS. **4**, **6**, and **8**.

In the embodiment of FIGS. **2-10**, the linkage comprises a longitudinally extending structure that mechanically couples the locking mechanisms in a rigid frame. In alternative embodiments, the fence may comprise a front frame portion and a rear frame portion having a linkage that enables the front frame portion and rear frame portion to be moveable with respect to each other, e.g., by sliding within each other. In this embodiment, the rear clamping lever may be replace with a fixed clamping structure that is moved into and out of engagement with the rear guide rail as the front and rear frame portions are moved with respect to each other.

Referring now to FIG. **11**, an alternative embodiment of a rip fence with independent alignment and locking is depicted. In this embodiment, the rip fence **150** includes a fence **152**, a rear clamping lever **154**, and a front clamping mechanism **156**. The fence **152** comprises a body, e.g., frame or casing, that extends substantially all the way across the table from the front edge **24** to the rear edge **26**. The rear clamping lever **154** extends downwardly from the fence to a position adjacent the rear guide rail (FIG. **2**). However, in this embodiment, the rear clamping lever **154** is fixedly attached to the rear end portion of the fence **152** is and is not configured to pivot with respect to the fence. In this embodiment, the casing of the fence **152** that extends from the front clamping mechanism to the rear end portion of the fence form the linkage between the handle and the rear clamping lever.

The front clamping mechanism **156** includes a fence insertion member **158**, a front bracket member **160**, and a front clamping lever **162**. The fence insertion member **158** comprises a small piece that is configured to slide within a channel **164** in the casing of the fence **152**. The front bracket member **160** is fixedly attached to the fence insertion member **158** and extends downwardly from the fence insertion member to a position adjacent an outer surface of the front guide rail **28**. The front clamping lever **162** is pivotably attached to the fence insertion member **158** and extends downwardly from the fence insertion member to a position where it can be pivoted into and out of engagement with an inner surface of the front guide rail **28**.

Because the fence **152** and rear clamping lever **154** are a solid piece, there is no need for a clamping rod. Rather, in this embodiment, the clamping handle **166** is pivotably attached to the front end portion of the fence **152**. The clamping action of the clamping mechanism is still very similar to the other embodiments. As the handle **166** is pivoted downwardly from the open position towards the closed position, the lever portion of the handle **166** pushes the upper portion of the front clamping lever **162** and causes the front clamping lever **162** to pivot into engagement with the inner surface of the front guide rail **28**.

Although not labeled in FIG. **11**, the front clamping mechanism includes a bearing and alignment assembly, such as described above in conjunction with the FIGS. **2-10**. As depicted in FIGS. **9** and **10**, the bearing and alignment assembly includes spring loaded bearings (FIGS. **9** and **10**) and stationary bearings that hold the hold the fence in alignment when the fence is unlocked and that enable the front clamping lever to be pivoted and brought into engagement with the front guide rail without upsetting the alignment of the fence.

After the front clamping lever **162** is pushed against the rail **28**, continued movement of the handle to the closed position will cause the handle to pull the fence forward until the rear clamping lever engages the rear rail. After that, the front bracket member **160** will be brought into engagement with the outer surface of the front guide rail **28**. Once the front bracket member **160** engages the front guide rail **28**, additional clamping force is created through compliance in the system.

While the disclosure has been illustrated and described in detail in the drawings and foregoing description, the same should be considered as illustrative and not restrictive in character. It is understood that only the preferred embodiments have been presented and that all changes, modifications and further applications that come within the spirit of the disclosure are desired to be protected.

What is claimed is:

1. A rip fence for a table saw comprising:

a frame having a front portion and a rear portion;

a front clamping lever pivotably supported in the front portion of the frame for movement between a clamped and an unclamped position, the front clamping lever being configured to be moved into and out of engagement with a front guide of the table saw when moved between the clamped and the unclamped positions;

a handle pivotably supported in the front portion of the frame for movement between a locked and an unlocked position, the handle including a lever portion that engages the front clamping lever and moves the front clamping lever from the unclamped to the clamped position when the handle is moved from the unlocked position toward the locked position;

a rear clamping lever attached to the rear portion of the frame and movable between a clamped and unclamped position, the rear clamping lever being configured to be

moved into and out of engagement with a rear guide of the table saw when moved between the clamped and unclamped positions;

a linkage that operatively couples the handle and the rear clamping lever;

a member configured to support the front portion of the frame, the member including a clamping portion extending downward from the frame adjacent to an outer surface of the front guide; and

a bearing and alignment assembly attached to the clamping portion of the member, the bearing and alignment assembly including a plurality of roller bearings that are configured to slide within a slot defined in the front guide of the table saw, the plurality of roller bearings being configured to engage opposing surfaces of the slot to maintain the frame at a predetermined orientation with respect to the front guide and the rear guide when the handle is in the unlocked position,

wherein the plurality of roller bearings includes:

at least one stationary roller bearing that is fixedly attached to the member for engaging a first inner surface of the slot; and

at least one spring-loaded roller bearing that is spring-loaded against a second inner surface of the slot opposite the first inner surface; and

wherein, when the front clamping lever is moved to the clamped position by the lever portion of the handle, continued movement of the handle to the locked position results in the handle pulling the linkage and the rear clamping lever toward the front portion of the frame and causes the rear clamping lever to move from the unclamped to the clamped position.

2. The rip fence of claim **1**, wherein the handle is movable to an intermediate position between the locked position and the unlocked position, the lever portion of the handle configured to:

move the front clamping lever from the unclamped position to the clamped position and into engagement with the front guide as the handle is moved from the unlocked position toward the intermediate position, and

move the rear clamping lever from the unclamped position to the clamped position and into engagement with the rear guide as the handle is moved from the intermediate position toward the locked position such that the rear clamping lever is moved and engaged with the rear guide after the front clamping lever is moved and engaged with the front guide as the handle is moved from the unlocked position toward the locked position.

3. The rip fence of claim **2**, wherein the at least one spring-loaded roller bearing is configured to generate a spring force,

wherein the lever portion of the handle includes a cam portion, the cam portion being configured to apply a first clamping force to the front clamping lever as the handle is moved from the unlocked position to the intermediate position and to apply a second clamping force to the front clamping lever as the handle is moved from the intermediate position to the locked position,

wherein the first clamping force is less than the spring force, and

wherein the second clamping force is greater than the spring force.

4. The rip fence of claim **3**, wherein the front portion of the frame is slidable in relation to the rear portion of the frame,

wherein the rear clamping lever is fixedly attached to the rear portion of the frame, and wherein the linkage comprises the rear portion of the frame.

5. The rip fence of claim **4**, wherein the front portion of the frame includes an insertion member that is slidably received in a channel defined in the end rear portion of the frame.

6. The rip fence of claim **3**, wherein the linkage comprises a rod that is coupled at one end to the handle and at another end to the rear clamping lever,

wherein the rear clamping lever is pivotably attached to the rear end portion of the frame for pivotal movement between the clamped and unclamped positions, and

wherein, when the front clamping lever is moved to clamped position by the lever portion of the handle, continued movement of the handle to locked position results in the handle pulling the rod and the rod in turn pivoting the rear clamping lever from the unclamped to the clamped position.

7. A table saw comprising:

a table including an upper surface and defining a blade opening;

a cutting assembly supported below the table and including a saw blade that extends upwardly through the blade opening;

a front guide rail attached to a front edge portion of the table;

a rear guide rail attached to a rear edge portion of the table; and

a rip fence slidably supported by the front guide rail and the rear guide rail, the rip fence including:

a frame having a front portion and a rear portion;

a front clamping lever pivotably supported in the front portion of the frame for movement between a clamped and an unclamped position, the front clamping lever being configured to be moved into and out of engagement with the front guide rail when moved between the clamped and the unclamped positions;

a handle pivotably supported in the front portion of the frame for movement between a locked and an unlocked position, the handle including a lever portion that engages the front clamping lever and moves the front clamping lever from the unclamped to the clamped position when the handle is moved from the unlocked position toward the locked position;

a rear clamping lever attached to the rear portion of the frame and movable between a clamped and unclamped position, the rear clamping lever being configured to be moved into and out of engagement with the rear guide rail when moved between the clamped and unclamped positions;

a linkage that operatively couples the handle and the rear clamping lever;

a member configured to support the front portion of the frame, the member including a clamping portion extending downward from the frame adjacent to an outer surface of the front guide rail; and

a bearing and alignment assembly attached to the clamping portion of the member, the bearing and alignment assembly including a plurality of roller bearings that are configured to slide within a slot defined in the front guide rail, the plurality of roller bearings being configured to engage opposing surfaces of the slot to maintain the frame at a predetermined orientation with respect to the front guide rail and the rear guide rail when the handle is in the unlocked position, wherein the plurality of roller bearings includes:

at least one stationary roller bearing that is fixedly attached to the member for engaging a first inner surface of the slot; and

at least one spring-loaded roller bearing that is spring-loaded against a second inner surface of the slot opposite the first inner surface,

wherein, when the front clamping lever is moved to the clamped position by the lever portion of the handle, continued movement of the handle to the locked position results in the handle pulling the linkage and the rear clamping lever toward the front portion of the frame and causes the rear clamping lever to move from the unclamped to the clamped position.

8. The table saw of claim **7**, wherein the handle is movable to an intermediate position between the locked position and the unlocked position, the lever portion of the handle configured to:

move the front clamping lever from the unclamped position to the clamped position and into engagement with the front guide rail as the handle is moved from the unlocked position toward the intermediate position, and

move the rear clamping lever from the unclamped position to the clamped position and into engagement with the rear guide rail as the handle is moved from the intermediate position toward the locked position such that the rear clamping lever is moved and engaged with the rear guide rail after the front clamping lever is moved and engaged with the front guide rail as the handle is moved from the unlocked position toward the locked position.

9. The table saw of claim **8**, wherein the at least one spring-loaded roller bearing is configured to generate a spring force,

wherein the lever portion of the handle includes a cam portion, the cam portion being configured to apply a first clamping force to the front clamping lever as the handle is moved from the unlocked position to the intermediate position and to apply a second clamping force to the front clamping lever as the handle is moved from the intermediate position to the locked position,

wherein the first clamping force is less than the spring force, and

wherein the second clamping force is greater than the spring force.

10. The table saw of claim **9**, wherein the front portion of the frame is slidable in relation to the rear portion of the frame,

wherein the rear clamping lever is fixedly attached to the rear portion of the frame, and

wherein the linkage comprises the rear portion of the frame.

11. The table saw of claim **10**, wherein the linkage comprises a rod that is coupled at one end to the handle and at another end to the rear clamping lever,

wherein the rear clamping lever is pivotably attached to the rear end portion of the frame for pivotal movement between the clamped and unclamped positions, and

wherein, when the front clamping lever is moved to clamped position by the lever portion of the handle, continued movement of the handle to locked position results in the handle pulling the rod and the rod in turn pivoting the rear clamping lever from the unclamped to the clamped position.

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